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**Filed** : **March 1, 2002**

### **REMARKS**

In the Office Action, the Examiner has rejected claims 1-4, 6, 8-10, 12-14, 16, 18-21, 27, 29, and 30 under 35 U.S.C. § 102(b) as being anticipated by Vanderlip (U.S. Patent No. 5,892,155). The Applicant has carefully reviewed the Vanderlip '155 reference and notes that Vanderlip clearly discloses a wire pull tester fixture which is clearly separate and distinct from a wire bonder for forming the tested wire bonds. Vanderlip offers extensive description of apparatus for securing a semi-conductor device or substrate 28 on a device support 22 of the fixture 20 and also that the fixture 20 provides height adjustments of the fixture 20. Vanderlip also clearly discloses, (for example column 6 lines 47-62) that a tester 52 for evaluating the quality of the wire bonds is clearly distinct and separate from a wire bonder which formed the tested wire bonds. It is further clear that the Vanderlip devices are clearly constructed and suitable for post-production testing of the formed wire bonds. For example, "a semi-conductor device 28 is selected for the test and the die 68, wire 56, and both the die bonding pad 72 and the lead pad 76 connected to the wire 56 are exposed. The semiconductor device 28 is placed on the mounting surface 24 of the fixture 20". It is clear that the Vanderlip '155 device is both materially separate from the wire bonder which formed the tested wire bonds and is also configured for postproduction sampled testing, not in process testing via an integrated bonding tool and bond tester as in the Applicant's claimed invention.

The Applicant respectfully notes that the claimed inventions include "a method of testing wire bond connections between a bonding wire and a separate surface, the connections being produced by a bonding head with a bonding tool and a wire clamp associated with the bonding tool ... raising the bonding head or the wire clamp with bonding wire gripped therein...during which process the tensile force acting on the bonding wire is measured" (Claim 1 as currently amended). The claimed invention also includes "a wire bonder comprising an integrated bonding head and a testing arrangement for testing wire bond connections formed between a bonding wire and a separate surface by the bonding head ... and a force measuring device associated with the wire clamp holder in order to measure a tensile force acting on a bonded connection to the bonding wire that has been produced" (Claim 4 as currently amended). The claimed invention further includes "a method of testing wire bonded connections between a bonding wire and a separate surface having a bonding site, the method comprising ... fixedly gripping the bonding

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wire with a wire clamp; and raising the bonding tool for a second distance during which process the tensile force acting on the bonding wire is measured by the bonding tool" (Claim 12 as currently amended). The Applicant strongly believes that the claimed features of a bonding tool incorporating an integrated testing arrangement such that a bonding test can be performed in process by the bonding tool itself is clearly not anticipated by the Vanderlip '155 reference and that claims 1-4, 6, 8-10, 12-14, 16, 18-21, 27, 29, and 30 as amended by this paper are clearly patentable under the requirements of 35 U.S.C. § 102(b) over the Vanderlip '155 reference.

The Examiner has also rejected claims 1, 2, 11-19 and 18-20 under 35 U.S.C. § 102(e) as being anticipated by Sykes (U.S. Patent No. 6,301,971). The Applicants have carefully reviewed the Sykes '971 reference and respectfully note that Sykes discloses a testing apparatus which is clearly separate and does not incorporate any sort of bonding tool. More particularly, Sykes '971 discloses several embodiments of the testing apparatus including unequal length cantilever arms 14a, 14b and which terminate at their free ends in a moving mass 15. The moving mass 15 is able to move up and down within limits imposed by resilient return forces exerted by the arms 14a, 14b. The Sykes devices include either an air dashpot assembly 20 or a damper 71 including permanent magnet 72 which can induce eddy currents in a vane 74 to damp oscillatory motion which may occur in the arms 14a, 14b, for example upon sudden failure of a bond or a breakage of a bond wire. However, the Applicant respectfully notes that Sykes '971 clearly fails to disclose any sort of bonding head or tool for actually forming the wire bonds to be tested. Sykes thus clearly discloses solely a separate testing apparatus not a wire bonding tool and particularly not a bonding tool with an incorporated testing apparatus as in the Applicant's claimed invention. Sykes also clearly fails to disclose a method of testing wire bonds with the bonding tool itself to facilitate in-process rather than post-process testing. The Applicant thus strongly believes that the subject application is clearly patentable under the requirements of 35 U.S.C. § 102(e) over the Sykes '971 reference and respectfully requests that the pending rejection of claims 1, 2, 11-16, and 18-20 be withdrawn.

The Examiner has further rejected claims 11 and 23 under 35 U.S.C. § 103(a) as being unpatentable over Vanderlip '155 in further view of Kelly et al. (U.S. Patent No. 5,894,981). The Applicant has carefully reviewed the Kelly '981 reference and notes that Kelly discloses an integrated pull tester with an ultrasonic wire bonder. The Kelly device is configured to both form

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wire bonds and perform pull testing of those bonds, however in a manner significantly different than in the Applicant's claimed invention. More particularly, the Kelly '981 reference "uses the fundamental concept of making a pull test at a given particular pull force to establish whether a bond has been properly made" (cf. column 3, lines 24-26). Kelly '981 further discloses "Figure 2 shows a wire that is being held by a wire clamp 24. The wire 22 and the wire clamp 24 are shown with a bonding tool 26. The wire clamp 24 comprises two jaws 28 and 30 that hold the wire therein"... "the elements of Figures 2 and 2B are attached to a bonding head of significant complexity that causes the tool 26 and claim 24 to move in X, Y, and Z directions"... "in order to provide control, movement, and force on the bonding tool 26, a forcer mechanism in a form of a magnet having north and south portions N, and S respectfully is controlled by a coil 80 that is driven by force controller 82. As the bonding tool 26 pivots upwardly and downwardly the force can be adjusted. A position sensor 86 is shown that positions the bonding tool 26 as it pivots around pivot point 74. ...the entire movement is controlled by a central processor 94 which activates the movement through the forcer mechanism 80 as controlled by the force controller 82."..."when the clamp is closed, at an appropriate pull height which has been established, a pulling force against the bond wire is effected under a programmable amount of force. This pulling in the axial direction of the wire allows a test of the first bond that has been formed in the showing Figure 6C. If the wire does not move from the surface and is relatively static, taking into consideration a programmable amount of stretch or movement due to orientation of the wire, a good bond has been established. In effect, the lack of movement of the tool 26 and the clamp 24 in its closed position when lifting or pivoting the bond head establishes the bond is firm fixed and in place" (cf. column 3, lines 24-26, column 4 lines 21-24, and 39-41, column 5 lines 18-38 and column 6 lines 22-37).

As will be well understood, the Kelly '981 reference discloses, an apparatus and a method of performing both wire bond formation and wire bond testing however in a manner that is clearly based on application of predetermined forces and verification of good wire bonds by absence of separation or breakage of the bond and or wire. Kelly '981 clearly does not disclose including or providing any kind of force measurement device with the bonding tool, but rather relies on applications of predetermined forces appropriate to the particular application, for example between the disclosed small and large wire embodiments. Thus the Applicant strongly

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believes that none of the claims of the subject application and more particularly, claims 11 and 23 are obvious under the requirements of 35 U.S.C. § 103(a) over the combined disclosures of Vanderlip '155 and Kelly '981.

The Examiner has also rejected claims 2-4, 6-8, 21, 23, and 27-30 under 35 U.S.C. § 103(a) as being unpatentable over Sykes '971 in view of Kelly '981. Again, as previously noted, Sykes '971 clearly teaches a separate apparatus for the testing of a wire bond which does not in any way include a wire bonder itself and certainly not a wire bonder incorporated with a testing apparatus such that a pulled force can be measured by the bonding tool as in the Applicant's claimed invention. As also previously noted, Kelly '981 teaches a wire bonder that can also perform certain testing functions, however these are strictly based on application of a predetermined force and clearly does not include any force measuring capacity as in the Applicant's claimed invention. Thus, the Applicant clearly feels that the combined disclosures of Sykes '971 and Kelly '981 even taken in combination fail to teach, or even to suggest the Applicant's claimed invention. The Applicant strongly believes that claims 2-4, 6-8, 21, 23, and 27-30 are clearly patentably nonobvious in view of Sykes '971 and Kelly '981.

The Applicant respectfully reminds the Examiner of the advantages of the claimed invention of not only providing a system and method for in process testing of wire bonds by performing a testing or evaluation via force measurement of the formed bonds by the wire bonder itself which avoids the need for a separate testing apparatus as well as the delay and additional effort required to transfer a wire bonded piece from a wire bonding tool to a testing apparatus, for example as in the Sykes' and Vanderlip disclosures. The Applicant's claimed invention provide the even further advantage of more accurately performing the wire bond test or evaluation by actually measuring the force acting on the bonding wire and or bonded connection. The Applicant strongly believes that these features provide significant novel and inventive advantages to the field which are clearly neither anticipated nor rendered obvious by the combined art of record.

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### SUMMARY

From the forgoing, the Applicant believes that the subject application is patentable under 35 U.S.C. § 102 as well as 35 U.S.C. § 103(a) over Sykes '971, Vanderlip '155 and Kelly '981 as well as the other art of record taken individually or in any possible combination. The Applicant thus believes that the subject application is in a condition ready for allowance and respectfully requests prompt issuance of a notice of allowability. The Applicant believes that this paper fully addresses the objections made by the Examiner in the Office Action, however should there remain any further impediment to the allowance of this application that might be resolved by a telephone conference, the Examiner is respectfully requested to contact the Applicant's undersigned representative at the indicated telephone number.

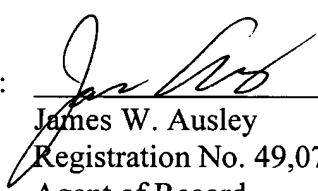
Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

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